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### NEW SPECIES OF NORTH AMERICAN GOMPHINE DRAGONFLIES AND LIFE-HISTORY NOTES ON SOME OF THEM.

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Among the dragonflies that have been accumulating in my collection during recent years there are several new species. There is also some new life-history material that I wish to put on record. I begin with a new species of which I have both adult and nymphal stages.

**Gomphus mortimer** sp. n. Fig. 1, A, B, C and D.

Length 50 mm.; abdomen 38; hind wing 29.

This is a blackish species, faintly striped with greenish. Face wholly pale. Top of frons also pale in front, but its basal third is covered with a cross stripe of brown, the margin of which projects forward a little in the middle longitudinal furrow. This stripe is confluent with the black that covers the entire vertex, though the latter is paler behind the low, transverse, three-lobed, post-ocellar ridge. Antennae black. Occiput yellow; its high circular hind margin edged with brown and fringed with long brown hairs. There is a similar fringe of hairs behind each eye, and another below at the front. The whole face is thinly pilose.

Prothorax brown above, with a small median yellow twin spot and a larger spot each side on the middle lobe. The whole thorax is thinly clad with brownish hairs (whitish about the leg bases). The front of the synthorax is fuscous striped with greenish. On the front are the usual two pale stripes each of them wider than the intervening fuscous band. This median band is narrowly divided by a yellow middorsal carina. Each of the greenish stripes is dilated below to overspread the collar and at its upper end each is prolonged laterally, underneath the

crest toward the upper end of a narrow antehumeral greenish stripe. Behind the fuscous band that broadly covers the humeral suture, the sides of the synthorax are more greenish than brown, with narrower and more diffuse dark stripes covering the other lateral sutures. The one on the middle suture is bent and interrupted above the spiracle; the one behind it is entire. All these brown stripes are conjoined above on the subalar carina and below near the leg bases, and the rearmost one is prolonged to rearward at its lower end around the border of the metepimeron in a fuscous J-mark.

The wings are hyaline with brown veins. Ante- and post-nodals are 12-14; 10-12 and 9; 10-11 in fore and hind wing respectively. Behind the anal vein of the hind wing in each of the interspaces bordering vein A<sub>2</sub> there are first two or three single cells and then two rows thereafter to the hind margin. There is a single, triple-length cell bordering the hind end of the male anal triangle. The legs are black beyond the short basal segments except for the under side of the front femora; the joinings of the tarsus and the claws are touched with yellow. The dense comb on the inner side of front tibia is brown.

The abdomen is blackish on the middle segments, with the usual middorsal line of lanceolate pale spots; very narrow beyond segment 2. The sides of 1, 2 and the base of 3 are extensively yellow including the auricle. A transverse ridge at the rear of the dorsum of segment 1 bears a tuft of long brown hairs. The caudal appendages of the male are blackish, as is also the anterior hamule of the second segment; the posterior hamule is brown-tipped and hairy externally. The 8th and 9th abdominal segments are wanting, from the type specimen, having been destroyed by anthrenids, but the uninjured appendages are preserved and are shown in figure 1, C.

The peduncle of the penis is blackish, higher (vertically) than wide, truncated at the end, deeply channeled at the front, and rugose and hairy at the rear, and the single, sickle-shaped cornicle of the penis is very short, and tapered to a Y-shaped fork at the tip. The superior caudal appendages of the male are rather short and stout, and each has a large obliquely placed and downwardly directed inferior tooth, which projects to rearward and inward and is visible from above, opposite and a little distal to a rather sharp angulation on the outer side that bears a minute inferior denticle. The inferior appendage is short and very widely forked, its branches spreading far outside the superiors.

This species is nearest *Gomphus quadricolor* but smaller. The color pattern is very similar but the black areas in this are less extensive and the claws are partly yellow. The tenaculum-like hook of the anterior hamule is longer. The apical tooth of the superior appendage of the male as seen in side view in *quadricolor* is absent in *mortimer*, or at least there is no distinct notch setting it off from the large more proximal tooth. The outer margin of the superior appendage in *quadricolor* runs out directly to the apex and is not cut off on a long bevel as in *mortimer*. The fork of the inferior appendage is much more widely outspread in *mortimer*.

The peduncle of the penis is high while that of *quadricolor* is low, mound-like, broadly rounded (Fig. 1, B).

Two specimens were collected by myself in Chipola Lake, Florida, in April, 1929. They were taken on a moss-covered, floating cypress log. Both were males. One was rather teneral, but had the color pattern fully developed. It is the one on which the above description of the adult is based. The other was in process of transformation, with head and tail not fully withdrawn from the nymphal skin. On the latter is based the following description of the nymph. The genitalia of the emerging specimen were sufficiently developed for determination that both specimens belonged to one and the same species.

*The nymph* measures in total length 31 mm.; abdomen 20; width of head 6; of abdomen 7. It is patternless, and of the usual slender form, similar to that of *quadricolor*.<sup>1</sup> The middle lobe of the labium is slightly convex in front. The lateral lobe terminates in strong arcuate end hook, before the tip of which on the inner margin there are about six strong teeth. These teeth are largest in the middle of the row and all are sharply and obliquely truncated with points directed proximally.

The abdomen bears vestiges of middorsal hooks on segments 7 to 9. On 3 to 7 the scars upon the sides of the segments are in bulging clusters; they are lower on 8 and 9. There are strong and sharp lateral spines on 6 to 9, smaller on 6, subequal on 7 and 8, longer on 9, where they are about one-fourth as long as the cylindrical 10th segment. The superior and inferior appendages are subequal in length, with the laterals about one-seventh shorter.

The chief differences seem to be that the teeth on the inner margin of the lateral labial lobe are larger and more deeply cut, the superior

<sup>1</sup> See Walker's figure in *Canad. Ent.*, 64: 271, 1932.

and inferior appendages of the abdomen are of more nearly equal length with the laterals almost as long.

I take pleasure in naming this pretty little Gomphine for my good friend and oftentimes field-work associate, Dr. Mortimer Demarest Leonard. He took Professor C. R. Crosby and myself by automobile to Chipola Lake, Florida, for a collecting trip that will ever be memorable for the uniqueness of the environment and its pleasant associations.

**Gomphus (Stylurus) jucundus** sp. n. Fig. 1, E, G and H.

Length 54 mm.; abdomen 40; hind wing 33.

This is a blackish species, much like *G. plagiatus*, but smaller. The face is olivaceous, yellowish about the mouth, with black-edged labium and black-tipped mandibles. The labrum has a broad blackish border and a brown median longitudinal stripe. The sutures of the face are narrowly brown and twin areas of black overwash cover most of the vertical face of the frons. The occiput is yellow, its outer corners brown, its hind border slightly prominent and scantily fringed with long black hairs.

The prothorax is obscurely infuscated, its dorsum with a yellow front lobe, and the median lobe with a pair of submedian yellow spots. The synthorax is dark brown in front, with a yellow crossband on the collar that connects with the yellow of the carina. The dorsal yellow stripes are isolated and strongly divergent forward, reaching nearer to the collar below than to the crest above. The edges of the crest are black. The sides of the synthorax are yellowish, with black stripes on all the lateral sutures, the one on the humeral suture being widest.

The legs are all black beyond their bases except for the pale under side of the front femora. The wings are hyaline, with brown veins and blackish stigma. Ante- and postnodal cross-veins 13-14: 8-9 and 10: 9 in fore and hind wing respectively. In the fore wing there are six cells in the paranal row (the row behind the anal vein) with two additional intercalated cells next the wing margin. In the hind wing there are four paranal cells and five postanals.

The abdomen is blackish, but with the sides of segments 1 and 2 mostly yellowish, with black bars on 2 that run down the sides, one behind the auricle and the other on the apical intersegmental margin. There is the usual middorsal pale stripe that is widest on 1, trilobed on 2, narrowed to a line on the middle of 3, reduced to basal spots on 4 and 5, becomes a basal

triangle on 6 and 7, the one on 7 being longer than that on 6; 8, 9 and 10 are black, a little paler basally. The expanded sides of segments 8 and 9 are mostly yellow with black borders. The dorsum of the 10th segment ends in a little triangular tooth that projects to rearward between the bases of the superior caudal appendages.

The superior caudal appendages of the male are strongly divergent at the base, and so obliquely beveled beyond the middle that the outer sides of the pair are parallel in the distal half; the beveled margin is crenulate-toothed on the under side. The branches of the inferior appendages in their spread match the superiors, and are almost as long. On the tip of each branch is a black sharply-upturned tooth. Before that tooth there is a pit in the upper surface, that would seem to fit an erect spine on the head of the female.

The genital pocket of the second segment is very hairy about the edges. The posterior hamule is lanceolate, strongly inclined forward to its slender tip; the hidden anterior hamule lies across its base within; it may be seen from the side as it emerges from under an enlarged, bilobed anterior lamina. The bulging peduncle of the penis is inclined forward, not deeply cleft but contracted at the top by infolding of the rim at the back.

*The female* is slightly larger (length 56 mm.) and similar to the male in general pattern, but less deeply pigmented, having no black on the vertical face of the frons, the sides of the abdomen largely olivaceous, and segment 10 and the caudal appendages black. On each side of the vertex of the head a short sharp, black, pyramidal horn arises between the lateral ocellus and the eye. On the under side of the 8th abdominal segment the subgenital plate appears to be recessed in the sternum, hardly reaching to rearward upon 9. It is rather shallowly bilobed on the end, and divided longitudinally by a median groove.

*Type and Allotype*, a single pair taken in copulation at Crown Point, New York, on July 30th, 1939, by Dr. Archie Hess.

**Gomphus argus** sp. n. Fig. 1, F.

The following description is drawn from a single specimen that was collected twenty years ago, and recognized at once as a new species. Because it lacked the last five segments of the abdomen it was put aside to await more and better material for description.

Meanwhile I have made several collecting trips to the spot where it was found, and have told several entomologists who go there betimes to be on the lookout for it, but no more have been found. Meanwhile dermestids ruined the body of the one lone specimen, and there now remains available for description only the wings and the basal half of the abdomen. That half, however, has the second segment well preserved; and since the hamules of the male are of quite distinctive form and will alone be sufficient for recognition of the species, and since I do not expect to have another chance to search for more, I herewith describe it and offer figures of the male hamules.

Length of hind wing 29 mm.

The species is perhaps as nearly allied to *G. descriptus* as to any other. Its wings are hyaline with brown veins and stigma. The nodal crossveins are 13:11 and 9:9 in fore and hind wing respectively. The triangles have the front side a little broken near the outer angle, making them slightly four-sided; in the space beyond them there are two rows of cells, with an extra cell at the triangle in the hind wing only. There are five crossveins under the stigma in addition to the strong brace vein. Ranged along the anal vein in the fore wing there are five cells, with an added marginal cell behind the one in the middle of the row. In the hind wing there are four cells bordering the anal vein and five postanal cells bordering vein A1 and five bordering vein A2; the corresponding interspaces of these two anal branches are about of equal width, or that behind A2 is perhaps a little wider. In it, the cell which forms the hind angle of the wing is enlarged transversely to the wing axis, being at least three times as long as wide.

The basal segments of the abdomen are moderately enlarged, with marked narrowing on the third segment. Segments 1 and 2 are densely clothed with short stiff hair, and a thin line of hairs extends outward on the lower margins of 3. The auricle on 2 is a short well-rounded ridge with steep sides, its rounded edge and under side being beset with about thirty minute black prickles that are intermixed with stiff hairs. The erect edge of the penis guard is semi-elliptical, very slightly three-lobed on the end.

The anterior hamule is an elongate triangle, with rounded distal end, and just before the end on the posterior margin there is a single long, straight sharp spine. The posterior hamule is a little longer and twice as wide, flat, obliquely placed, bare on

the sides but hair fringed on the rear margin. It is ovoid-triangular in form with a short, sharp, beak-like, retrorse tooth on the inner side just before the rounded distal end. The peduncle of the penis is higher than wide, deeply cleft into two erect lobes that are a little aslant forward; single cornu at the tip, about as long as either middle segment, forked at its slender transparent tip.

The genitalia, the most critically distinctive parts in this genus, are most like those of *G. descriptus* Banks in shape and peduncle of the penis, but the anterior hamule is strikingly different.

*Holotype*: A single fragmentary male specimen that was collected near Argus Brook in the Lloyd Wild-life Reservation near McLain, N. Y., on June 4th, 1923, and that is now (on two slides and in alcohol) in the Cornell University collection.

*Gomphus consanguis* Selys (supposition). Fig. 2, C and D.

*The nymph* measures in total length 31 mm.; abdomen 20; hind femur 6; width of head 6; abdomen 9.

This is a flat nymph of the usual Gomphurus form, but with much more than the usual color pattern shown in that group. The general color is pale luteous (possibly greenish in life), patterned with brown. On the top of the head a ring of brown surrounds the middle ocellus, and from it run out faint brown streaks, forward to the base of the antennae and rearward to the rear of the eyes. Lined up across the rear of the head are five brown spots that are more or less connected along the occiput.

The antennae are heavily fringed on each side with long whitish hair. The third antennal segment is almost twice as long as the two basal segments taken together, and the fourth is only a minute subglobular rudiment. The labium is short and stout; mentum parallel-sided beyond the hinge fold, that distal portion being a little wider than long. The median lobe of the mentum occupies about a third of its total width. It is distinctly convex and fringed with the usual scales. The teeth on the inner margin of the lateral lobe are about eight, rather deeply incised, and obliquely truncate on their tips, with the sharp angles directed to rearward. The most distal tooth is adnate to the base of the strong end hook.

On the disc of the prothorax are two dimly-outlined quadrangular areas rimmed with brown. The synthorax is paler,

with a wash of brown in all its lateral sutures. The hairy legs are darkened on femora and tibiae, and have parallel linear scars and pale knees. A brownish middorsal band of symmetrically patterned mottling covers more than half the width of the dorsum of the abdomen. This band narrows to rearward. In the chocolate brown on each segment there are two submedian apical pale spots, a single large basal spot, and a more diffuse larger lateral spot. The caudal appendages also are mottled with brown.

The burrowing hooks on the fore and middle tibiae are long and strong. The wing cases reach the middle of the 4th abdominal segment. The sides of the abdomen are nearly parallel along the middle segments; most strongly narrowed to rearward on segment 9. There is a middorsal groove on segments 4 to 7. There are minute dorsal hooks on segments 8 and 9, their tips not surpassing the extended intersegmental folds of membrane. The lateral spines are well developed on segments 6 to 9, small, sharp pointed and increasing in size on 7 and 8, smaller again on 9. The sides of the 8th and 9th segments are markedly spinulose serrate.

Known nymphs of two other species of the *Gomphurus* group have the median lobe of the labium less convex: *adelphus* and *externus*. The former was described by Hagen in 1885.<sup>2</sup> It is smaller in stature (length 29 mm., as compared with 31) and is known only from New York and eastward. The nymph above described is similar to *externus* in size and general appearance, but is easily distinguished by the length of the lateral spines of the 9th abdominal segment (about as long as segment 10, whereas in *externus* they are about two and a half times as long). These spines are also straighter, not being incurved at their tips. Also the teeth on the lateral lobe of the labium are larger, fewer, and more deeply cut in this species, with the end hook longer-pointed.

This description is based on a single well-preserved specimen collected by myself in Cataloochie Creek, North Carolina, in the Great Smoky Mountains National Park on the 4th of April, 1934.

The supposition that this nymph belongs to *G. consanguis* is based on its form, its size, and the fact that it was taken not far from the type locality, Morganton, N. C.<sup>3</sup>

<sup>2</sup> Hagen, Trans. Amer. Ent. Soc., vol. XII, p. 242, 1885.

<sup>3</sup> Selys, C. R. Ent. Soc. Belg., XXII, p. lxvi, 1879.



*Gomphus laurae* Williamson (supposition).

*The nymph* measures in total length 36 mm.; abdomen 21; hind femur 6; width of head 8; of abdomen 10.

This heavily silted nymph is almost without color pattern and it is thinly hairy around all margins. It is greatly depressed, with short femora, wide flat head and wider abdomen. The antennae are set widely apart, with the long third segment strongly decurved in the middle, and the fourth a little cylindrical rudiment, hardly as long as the third is wide. The labium is large; its middle hinge reaches backward to the middle coxae. The mentum widens regularly forward to the base of the lateral lobes. The median lobe is low or with only a very slight convexity, fringed with the usual border of flattened scales. The lateral lobe is strongly incurved beyond the base of the stout movable hook; its strong end hook forms a short quarter-circle bend with its point set squarely across the median line. The teeth, deeply set on the inner margin, are very variable, the first and last being ill defined and merging with the inner border. The intermediate teeth vary in number from one to four; they are deeply cut, obliquely truncated on the end with the sharp corner drawn to rearward.

The front and middle tibiae have rather weak burrowing hooks: all femora have the usual sinuous bare lines.

The heavy abdomen is widest on segment 6. The relative lengths of its last four segments is as 8:8:10:2, with the caudal appendages about 7 on the same scale. There are no dorsal hooks (save for the merest vestige of one on 9); there are middorsal grooves on 4 to 7. There are large lateral spines on 6 to 9, on 4 to 6 subequal, their tips slightly incurved; tips of 9 straight and bare, reaching backward almost to the level of the tips of the caudal appendages; the latter, subequal, or the superior and inferiors successively a little shorter. The outer margins of the lateral spines are without serrulations, but they are fringed with long, thin hairs.

I have numerous specimens from the mountain streams of western North Carolina, but only two of them are full grown. Both of these were collected by Dr. James S. Gutsell from the Tuckasegee River, one on the 19th and one on the 25th of August, 1930. From the same collector I have about a dozen two-thirds-grown nymphs taken on the 4th of October, 1930, from the Catawba River. I have myself collected still smaller nymphs in the Great Smoky Mountain National Park at two places: seven nymphs (the largest, length 17

mm.) from Deep Creek on August 25th, 1931, and two (that Wm. D. Sargent and I took together) from Hazel Creek on the 4th of April, 1934.

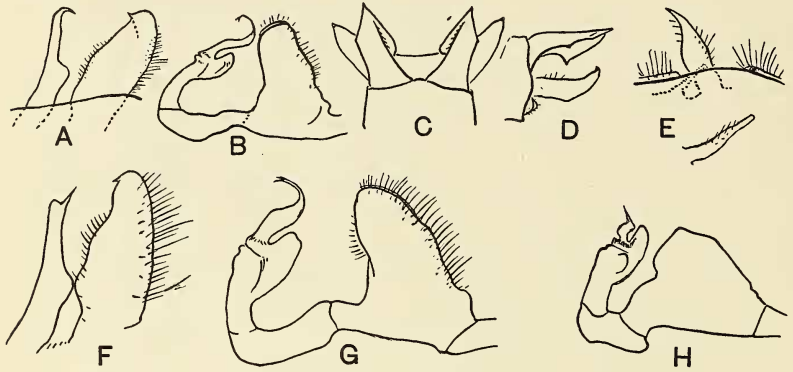


Figure 1. Male Genitalia.

A to D, *Gomphus mortimer* sp. n. A, Genital hamules; B, Penis; C, Caudal appendages in dorsal view; D, Same in lateral view.

F and G, *Gomphus argus* sp. n. F, Genital hamules; G, Penis.

E and H, *Gomphus (Stylurus) jucundus* sp. n. E, Genital hamules; the position of the anterior hamule indicated by the dotted lines; the anterior hamule alone shown below, slightly enlarged. H, Penis.

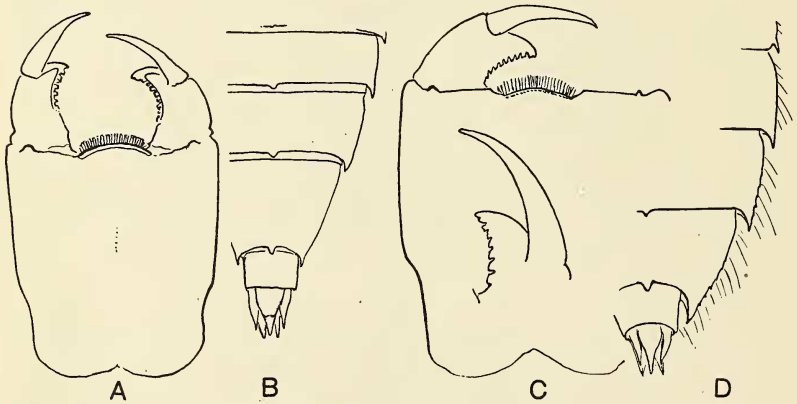


Figure 2. Nymphs.

A and B, *Gomphus mortimer*. A, Mentum of the labium; B, End of the abdomen.

C and D, *Gomphus (Gomphurus) consanguis* (supposition). C, Mentum of the labium, with its lateral right lobe detached and more enlarged; D, End of abdomen.